

Claims

1. A system for imaging and activation of sample comprising;
 - an illumination source producing an illumination beam;
 - a sample holding stage for holding a sample substrate onto which the illumination beam is directed;
 - imaging optics that collects light from the stage and transmits light as a collected light beam;
 - a light detector positioned to detect said collected light beam;
 - an optical activation beam source producing an activation light beam;
 - a spatial light modulator for selective illumination of discrete targets with an activation light beam on a sample on the sample holding stage; and
 - a controller that directs the optical activation beam to specified targets localized by detection of light from said light detector.
2. The system of claim 1, wherein said optical activation beam is a beam of ultraviolet light.
3. The system of claim 1, further including a condenser lens in the path of the activation light beam.
4. The system of claim 1, wherein optics for selective illumination includes digital micro-mirror device.
5. The system of claim 1, wherein said optical active beam is directed off axis with respect to said collected light beam.

6. The system of claim 1, wherein said optical activation beam is directed on axis with respect to said collected light beam, wherein a beam splitter positioned in a path of said collected light beam is used to direct the optical activation beam onto the sample.

7. The system of claim 1, wherein the imaging optics include:

- a first objective lens;

- a second objective lens;

- an objective lens mount onto which said first objective lens and said second objective lens are mounted, said mount allowing selective positioning one of said first objective lens and said second objective lens in a position to collect light from the sample and transmit collected light in a collected light beam;

- a first imaging lens;

- a second imaging lens;

- an imaging lens mount onto which said first imaging lens and said second imaging lens are mounted, said mount allowing a user to selectively position one of said first imaging lens or said second imaging lens in a collected light beam path, wherein any selected objective lens and imaging lens combination become a selected lens pair, wherein any selected lens pair is optically symmetrical;

- wherein said light detector is an area array detector, wherein light passing through said first or second imaging lens impinges on said area array detector; and

- an imaging filter positioned between in the path of the collected light beam at a region of parallel light rays.

8. The system of claim 1, further comprising an illumination filter placed in the path of the illumination light.

9. The system of claim 8, further comprising an illumination filter holder that allows one of a plurality of illumination filters to be positioned in the path of the illumination light.

10. The system of claim 7, wherein the area array detector is selected from the group consisting of a CCD detector, a CID detector, a CMOS detector or a photodiode array detector.

11. The system of claim 7, wherein said imaging filter is one of a plurality of imaging filters mounted on an imaging filter holder, such that said filter may be selectively rotated into the pathway of the collected light beam.

12. The system of claim 1, further including an autofocus system.

13. The system of claim 12, wherein said autofocus system includes a laser directed onto a reflective substrate on the sample holding stage, an array detector positioned to detect the reflected light, and a processor, wherein said processor determines the focus on the substrate by the location on the array detector to which reflected light is detected.

14. An assay method comprising:
detecting on a sample substrate localized targets;
illuminating localized targets with a beam of optical activation light directed by a spatial light modulator to the localized targets, said optical activation light releasing a caged compound; and
detecting a localized effect of said caged compound.

15. The assay method of claim 14, wherein said optical activation light is UV light.

16. The assay method of claim 14, wherein said spatial light modulator is a digital micro-mirror device.

17. The assay method of claim 14, where said localized targets are cells.

18. The assay method of claim 14, where detecting localized targets includes simultaneously detecting an array of localized targets using an optical detector including an area array detector.

19. The assay method of claim 14, wherein said detecting localized targets and said detecting a localized effect of said caged compound both are effected by one optical analysis system.